

Gesture Controlled Drone for Agricultural Assistance

Kingshuk Das¹, R. Moganaselvan², T. Bharathmaran³, S. Marirajan⁴

^{1,2,3}Students, Final Year, Department of ECE, Valliammai Engineering College, Tamilnadu, India

⁴Assistant Professor, Department of ECE, Valliammai Engineering College, Tamilnadu, India

Abstract - Drones nowadays are widely used around the world for a variety of purposes including aerial videography, photography, surveillance etc. In general, there is a requirement of a skilled pilot to perform these tasks using the drone which proves to be exorbitant. The task of piloting can be made much easier using gesture control. Here we are concerned with the gesture control of an aerial drone.

Gesture means any bodily motion or states particularly any hand motion or face motion. In our implementation, the Accelerometer is used for recognition of gestures, which are motion of the hand, and as a result, we can control the motion of the drone by simple gestures from the human hand. We also integrate a thermal camera to monitor the crop fields using thermal imaging.

Key Words: Drone, Agriculture, Crops, Fields, Thermal Sensor, Display, Accelerometer.

1. INTRODUCTION

Drones, or unmanned aerial vehicles (UAVs), have been used by the military since WWI for remote surveillance. Lately, farmers have begun using them to monitor their fields as well as aiding precision agriculture programs. It is estimated that 80 to 90% of the growth in the drone market in the next decade will come from agriculture. The Federal Aviation Administration (FAA) regulation currently limits drone usage to recreational. UAVs can monitor fields, take more detailed pictures, and are not obstructed by clouds. As the technology gets better and the cost continues to decrease, drones will have wider use in today's farm fields

1.1 HAND GESTURE STUDIES

The controller is mounted on a glove worn by users and detects in real time the yaw, pitch, and roll of the hand to translate into respective movements for the drone.

Instead of pressing some predefined buttons, users can move their fingers or wave their hand(s) in specific ways

That are recognized by sensors installed in the glove, which are then converted into digital commands. The transmission of commands is done over radio channels, so it is the same as the traditional control method.

1.2 DRONE STUDIES

- A typical unmanned aerial vehicle is made of light composite materials to reduce weight and increase maneuverability.
- Drones are equipped with different technology such as GPS and laser (military UAV).
- Drones are controlled by remote control also sometimes called as a ground cockpit.

2. EXISTING SYSTEM

Drones have been used for various commercial purposes such as delivery, construction, reconnaissance, cinematography, and in sports.

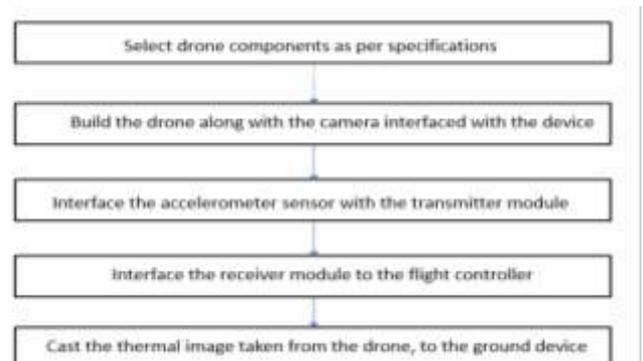
Drones have different state of the art technology such as infra-red cameras (military UAV), GPS and laser (military UAV).

3. PROPOSED SYSTEM

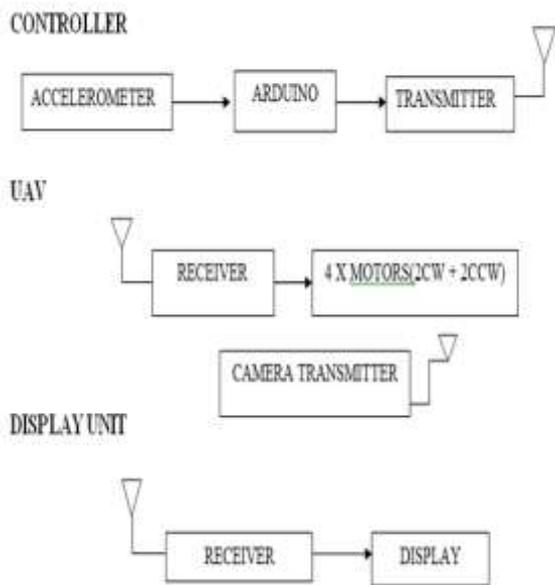
We are extending the functionality of the already available drones so that it is useful to collect agricultural data about crop fields, thereby making it easier for farmers to know about their fields. The gesture control will help in easier maneuvering of the drone.

The drone will carry a thermal imaging camera which will capture thermal images of the crop field. A simple analysis of the thermal images will give information about health of crops, water content in soil, presence of unwanted creatures between crops. The drone will also provide easier control.

4. FLOW



4.1 BLOCK DIAGRAM



5.1 ATMEGA328P NANO

Arduino Nano is a compact, compatible, flexible Microcontroller board, developed by Arduino.cc in Italy, based on ATmega328p (Arduino Nano V3.x) / Atmega168 (Arduino Nano V3.x).

This Arduino Nano comes with a 16 MHz crystal oscillator which is used to produce a clock of precise frequency using constant voltage. One limitation of using Arduino Nano is that it doesn't come with DC power jack, means you cannot supply external power source through a battery.



5. HARDWARE REQUIREMENTS

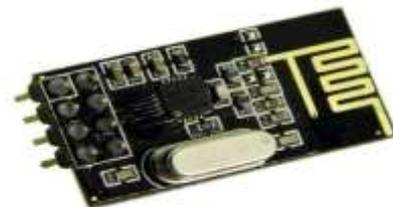
- Atmega328p NANO
- nRF24 transmitter
- nRF24 receiver
- Thermal camera
- 2200maH Li-Po Battery
- APM 2.8 Flight Controller
- Accelerometer MPU-6050

5.1 HARDWARE CONNECTIONS

- The parts of the drone are assembled together.
- The motors are connected to the ESC
- The ESC is connected to the common point of power supply.
- The input pins of flight controller APM is connected to the receiver module.
- The output pins of APM is connected to ESC connected to the motor.

5.2 nRF24 TRANSCEIVER

The nRF24 is used on a wide variety of applications that require wireless control. They are transceivers that means that each module can transmit and receive data. These modules can be used with any microcontroller (MCU). Specifications nRF24 – 2.4GHz RF Transceiver.



5.3 FLEX SENSOR

This flex sensor is a variable resistor. The flex sensor resistance increases as the body of the component bends. Nintendo Power Glove used these kind of sensors. They are also used as door sensors, robot whisker sensors,

or a primary component in creating sentient stuffed animals.

There are two sizes in which the flex sensors are available: one 2.2" long and another coming in at 4.5" long. Left flat, these sensors will look like a 30kΩ resistor. The resistance will increase up to 70kΩ at a 90° angle.



5.4 THERMAL CAMERA

This device can detect infrared waves and capture them as images. It is quite easy to view infrared images or measure the surface temperature of the objects, this product can be used for HVAC, building heat difference detection, equipment troubleshooting, maintenance, etc.



5.5 APM 2.8 FLIGHT CONTROLLER

APM 2.8 quadcopter Flight Controller is an upgraded version of 2.5, 2.6 with Built-in Compass for FPV RC Drone Aircraft is the new APM 2.8 flight controller. The sensors are the same as the APM 2.6 flight controller, but, there is an option to use the built-in compass, or an external compass via a jumper. Due to this the APM 2.8 ideal for use with multi-copters and rovers.



5.6 ACCELEROMETER MPU-6050

The MPU-6050 device makes use of a 3-axis gyroscope and a 3-axis accelerometer on the same silicon die along with an on-board Digital Motion Processor. These parts are the world's first Motion Tracking devices. It is specially designed for the low power, low cost, and high-performance requirements of smartphones, tablets and wearable sensors.



6. SOFTWARE REQUIREMENTS

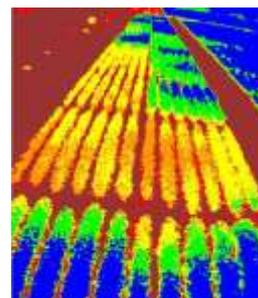
- *Arduino IDE (code compiling software)*
- *Embedded C*

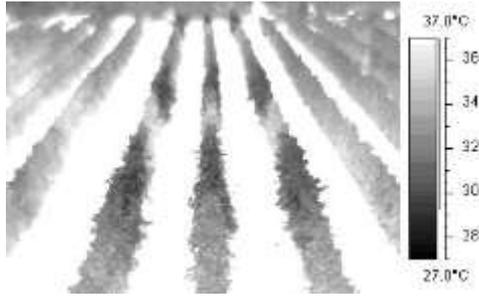
7.1 CONCLUSIONS

A fully functional drone carrying a thermal camera, which can be controlled by gesture, for surveying crop fields which will make the job of farmers easier and allow them to take decisions for further activities such as irrigation.

- Unmanned Aerial Vehicles poses a great advantage of quickly delivering data from remote locations.
- With the additional feature of gesture control, it provides the user with an easier control experience.
- Thus, this device will be of great assistance to farmers for accomplishing tasks which are difficult to be performed without technology intervention.

7.2 THERMAL IMAGE OUTPUT





8. REFERENCES

- 1) A. Sarkar, K. A. Patel, R. K. G. Ram, and G. K. Capoor, "Gesture control of drone using a motion controller," in 2016 International Conference on Industrial Informatics and Computer
- 2) S. Yueling, Z. Zengfeng, W. Hongsheng. "Agricultural information technology development and innovation path," Electronics, Communications and Control (ICECC), International Conference on, 2011.
- 3) C. Bing. "The Design and Operation of City Agricultural Sightseeing System with the Internet of Things Technology," Measuring Technology and Mechatronics Automation (ICMTMA), Sixth International Conference on, 2014.
- 4) B. Sanders, D. Vincenzi, and Y. Shen, "Investigation of GestureBased UAV Control," in Advances in Human Factors in Robots andUnmanned Systems, Chen J., Ed. Springer, Cham, jul 2017, pp.205–215.[Online].Available: http://link.springer.com/10.1007/978-3-319-60384-1_20